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THE UNIQUE MORPHOLOGY OF THE SPINES OF AN ARMED RAGWEED, AMBROSIA BRYANTII (COMPOSITAE)[1]

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The true ragweeds, wind-pollinated composites of the genus *Ambrosia*, include our most serious hay fever plants. They are generally herbs or subshrubs. Their indument commonly consists of delicate hairs and glands, although some species become more or less hispid. Spines are not characteristically borne on the vegetative body of ragweeds, in spite of the fact that most ragweed species are found in open or disturbed habitats where spiny plants are common. The species to be discussed, *A. bryantii*, is interesting not only for possessing spines, but for the nature of the spines themselves, which, to my knowledge, are unique among similar structures in vascular plants.

Armature of plants is accomplished in a number of ways, and the fact that many unrelated species possess spines is frequently used in teaching to illustrate convergent evolution. With the exception of the case of *A. bryantii*, presented below, spines which serve to protect the plant (thorns, prickles and other spine-like structures being included here under the term "spines") are formed from organs and tissues which are not directly associated with the flowers or fruits. They may be modified leaves (*Berberis thunbergii* DC.), leaf margins (*Cirsium* spp.), stipules (*Robinia pseudoacacia* L.), lateral branches (*Gleditsia triacanthos* L.), terminal shoots (*Rhamnus cathartica* L.), or epidermal emergences (*Rosa* spp.). Only one near relative of *Ambrosia* is spiny, i.e., *Xanthium spinosum* L. In this species the spines appear to be modifications of the two prophylls

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of the lateral branches, each prophyll being entirely changed to a three-branched spine.

In addition to such vegetative spines, which are more or less permanently associated with the plant, many species produce spiny fruits. Fruit spines may be of value to the organism as a means of dissemination of the seeds, or as protective structures which tend to prevent animals from eating the developing embryos, or often they serve both functions. Ordinarily, however, such spiny fruits are not retained by the parent plant as protective organs for the plant *per se*, but are shed when the seeds have developed.

In all respects the species under discussion here conforms to the genus *Ambrosia*, although I fail to find that the proper name combination has been made. Curran (1888) placed it in the genus *Franseria* before the true nature of the group was known. It was placed in the monotypic genus *Acanthambrosia* by Rydberg (1922) on the basis of having more than one achene per fruit. As Shinners (1949) pointed out, however, characters of this nature are not sufficient to distinguish genera in the Ambrosieae. Accordingly, the new combination is made below:

Ambrosia bryantii (Curran) Payne, comb. nov. *Franseria bryantii* Curran. Proc. Calif. Acad. ser. 2, 1:232. 1888. *Acanthambrosia bryantii* (Curran) Rydb., N. Am. Fl. 33:22. 1922.

In the genus *Ambrosia,* considerable modification of the floral structures has occurred. Pollen and fruit production are carried out by different heads on different parts of the plant. Staminate heads are borne in spikes at the tips of the branches. Each head consists of a cluster of centripetally developing, sterile flowers partially enclosed by a cup-shaped involucre, the phyllaries of which are fused laterally. Pistillate heads are found in the axils of leaves and bracts located below the staminate spikes. The pistillate flowers are borne singly or in clusters of from two to five. The involucre of the pistillate head has become concrescent, the phyllaries being united to form a hard, resistant, flask-shaped structure within which the achenes are borne. The tips of the phyllaries which form the involucral case are usually represented by more or less prominent spines. The spines may be blunt or sharp, straight or hooked at the tips, but in all species except *A. bryantii* they are short, usually shorter than the body of the fruit (fig. 1,C). The pappus is entirely lacking on both the male and the female flowers. Thus the fruit consists of one or more achenes enclosed by the spiny, indehiscent covering formed by the involucre of the pistillate head. In most species all of the fruits are shed at the end of the growing season, or as rapidly as they mature.

Ambrosia bryantii is found on the desert plains of central Baja California, Mexico, where it is common and often quite abundant. It forms a small, perennial shrub which bears clusters of long, chalky spines along its stems. These spines are usually more abundant toward the stem apices

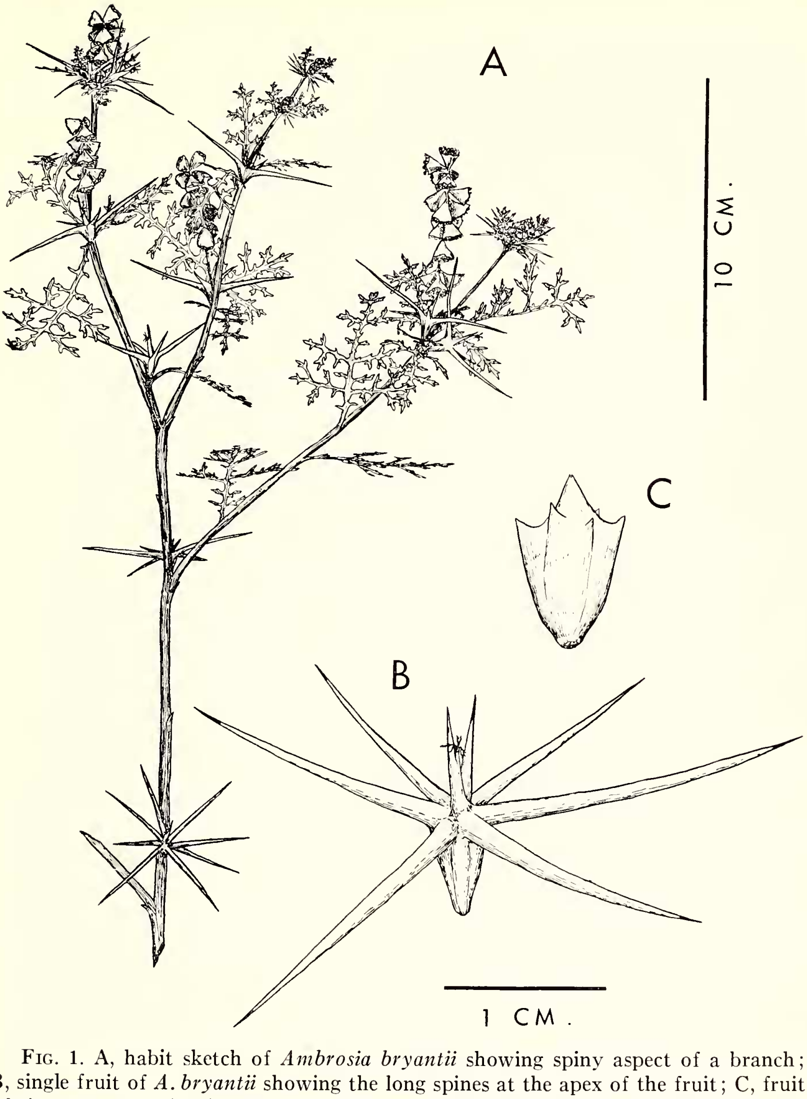

FIG. 1. A, habit sketch of *Ambrosia bryantii* showing spiny aspect of a branch; B, single fruit of *A. bryantii* showing the long spines at the apex of the fruit; C, fruit of giant ragweed, *A. trifida* L., a common, annual species of the eastern United States. A and B drawn mainly from *D. M. Porter 451*, from 29 miles south of El Crucero, Baja California, Mexico.

where one commonly finds inflorescences in all stages of development (fig. 1,A). When examined closely, these spines are seen to be borne on the fruits (fig. 1,B). The spines appear in every way to be homologous with the processes of the pistillate involucres of other species of *Ambrosia*. In *A. bryantii*, however, they are greatly exaggerated, forming very sharp spines 1.5 to 3.5 cm. long, with a basal diameter of 2 to 3 mm.

The unusual and significant fact is that some of the fruits remain permanently attached to the plant through several growing seasons. Examination of many specimens has shown that a certain number of the fruits which develop during the perennial growth of the plant are thus retained and serve the function of armature.

In summary, the spines of *A. bryantii* represent what appears to be a unique morphological type of protective device, at least in the North American flora. They are actually borne on the fruits of the plant. The whole plant tends to become spiny because some of the fruits remain permanently attached to the stems. This unusual armature of *A. bryantii* adds another striking illustration to the many examples of convergence in the evolution of vascular plants.

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NOTES AND NEWS

The following publications are of interest.

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